

INFORMATIONAL LEAFLET NO. 171

PRELIMINARY FORECASTS AND PROJECTIONS FOR 1977 ALASKAN SALMON FISHERIES

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January 1977

PRELIMINARY FORECASTS AND PROJECTIONS FOR 1977

ALASKAN SALMON FISHERIES

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January 1977

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SUMMARY

A commercial salmon harvest of 35 million fish is projected for Alaska in 1977. The harvest is not expected to be less than 23 million nor more than 46 million. Based on projection experience since 1970, only 1 of 4 realized harvests would fall outside this range.

The 1976 commercial salmon harvest exceeded 43 million fish. The decline of 8 million fish projected for 1977 is primarily due to anticipated weak sockeye salmon returns to Bristol Bay and moderate to severe pink salmon declines in central and western Alaska.

INTRODUCTION

This is the eighth in a series of annual reports prepared by the Division of Commercial Fisheries, Alaska Department of Fish and Game, presenting harvest and return forecasts and projections of Alaska's commercial salmon fisheries. These reports are released in December to make the information available to the Board of Fisheries and the fishing industry well before the season begins.

In order to provide forecast information at this time it has been necessary to utilize preliminary harvest and return data from the 1976 season. In the past, forecasts and projections based on final harvest and return data have differed little from the preliminary results.

Projections of statewide commercial salmon harvests have been made yearly since 1969. A summary of the accuracy of these projections is presented in Table 1. On the average, the projections have been too high by about 3 million fish, slightly less than 8% of the realized commercial harvest. The average error without regard to sign is 27% of the actual harvest, 10 million fish. Accuracy of the projection has improved every year since 1972. Projection errors stem from imprecise knowledge of salmon escapements, numbers of fry or smolt produced and estuarine and marine survival.

Terminology and Definitions

Salmon return or run:	The total number of mature salmon returning in a given year from ocean rearing areas to coastal waters.
Escapement, spawning population or brood stock:	That portion of a salmon run which is not harvested and survives to reach the spawning grounds.
Forecast:	Forecast harvests and returns are calculated using ancillary information such as parent-year escapements, subsequent fry abundance, spring sea water temperatures and escapement requirements.
Harvest Projection:	Harvest projections are averages of recent harvests. They may be modified subjectively when qualitative escapement or other relevant information is available. Only harvests are projected.

Table 1. Projected and realized Alaska commercial salmon harvest, with absolute and relative errors, 1970-1976.

(Number of fish in millions)

Season	(1) Projected harvest	(2) Actual harvest	(3) Error: (1) - (2)	(4) Relative Error: (3)/(2) X 100%
1970	91.5	68.5	23.0	34%
1971	41.5	47.5	-6.0	-13%
1972	46.7	32.0	14.7	46%
1973	30.0	22.3	7.7	35%
1974	15.6	21.8	-6.2	-28%
1975	19.9	26.2	-6.3	-24%
1976	<u>37.1</u>	<u>43.4</u> ^{a/}	<u>-6.3</u>	-15%
Total	282.3	261.7	20.6 (70.2) ^{b/}	
1970-76 Average	40.3	37.4	2.9 (10.0) ^{b/}	7.8% (27%) ^{b/}

^{a/} Preliminary data.

^{b/} Values in parentheses are the sum or average of errors or relative errors without regard to sign.

Pacific Salmon Species

<u>Scientific Name</u>	<u>Common Names</u>
<u>Oncorhynchus tshawytscha</u>	chinook, king
<u>Oncorhynchus nerka</u>	sockeye, red
<u>Oncorhynchus kisutch</u>	coho, silver
<u>Oncorhynchus gorbuscha</u>	pink, humpy, humpback
<u>Oncorhynchus keta</u>	chum, dog

Primary Brood Years Contributing to the 1977 Salmon Return^{a/}

Species	Age of Returning Salmon in Years				
	2	3	4	5	6
Pink	1975				
Chum		1974	1973		
Coho		1974	1973		
Sockeye			1973	1972	1971
Chinook			1973	1972	1971

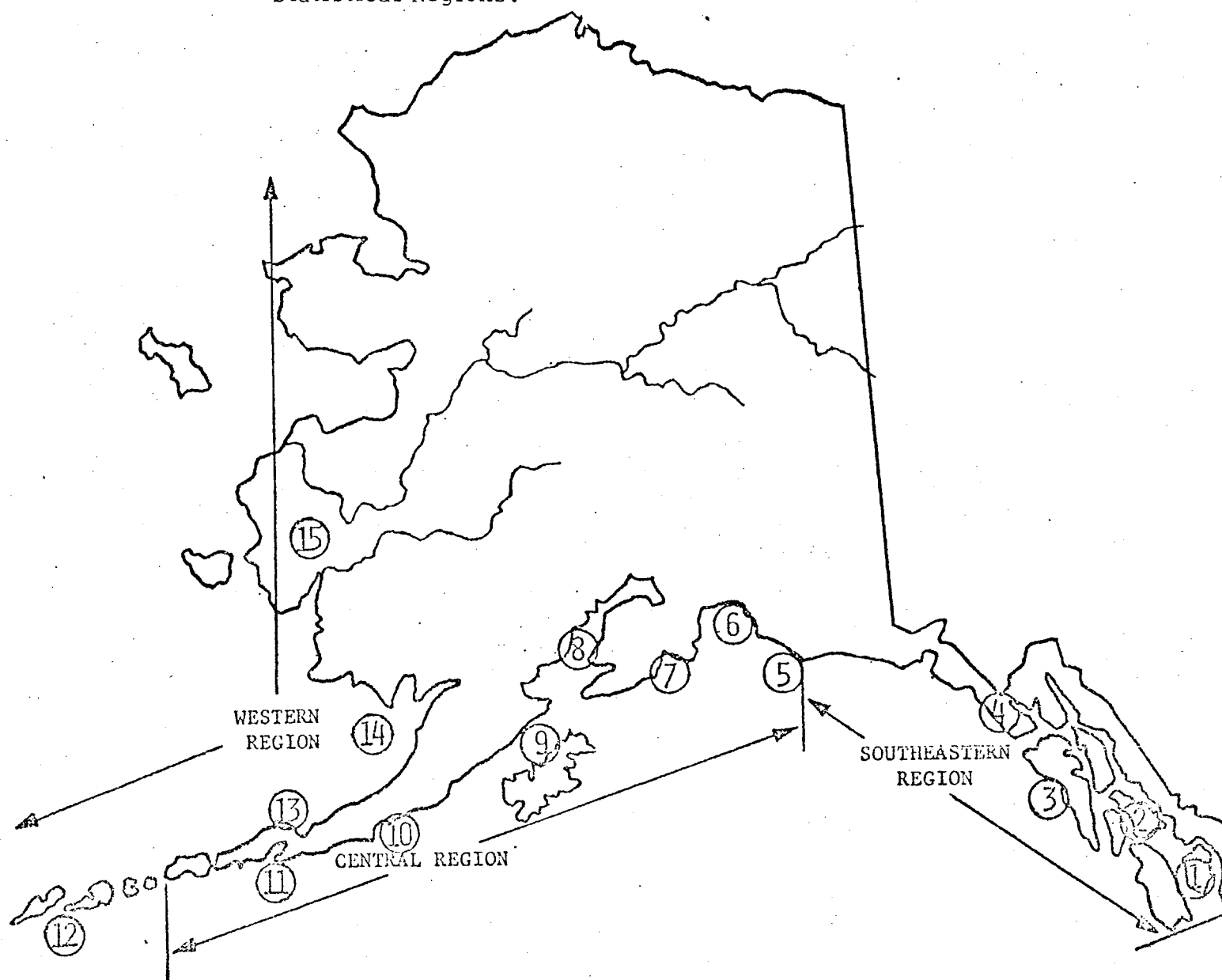
^{a/} The age classes listed for each species generally comprise more than 90% of the run.

The boundaries of and major fishing areas in the Southeastern, Central and Western statistical regions are shown in Figure 1. These regions and areas are the ones used in the Department's statistical leaflet series and in prior statistical reports.

Acknowledgments

Materials presented in this report were prepared by Division of Commercial Fisheries biologists located in field offices throughout the

Figure 1. Alaska Department of Fish and Game Commercial Fisheries Statistical Regions.



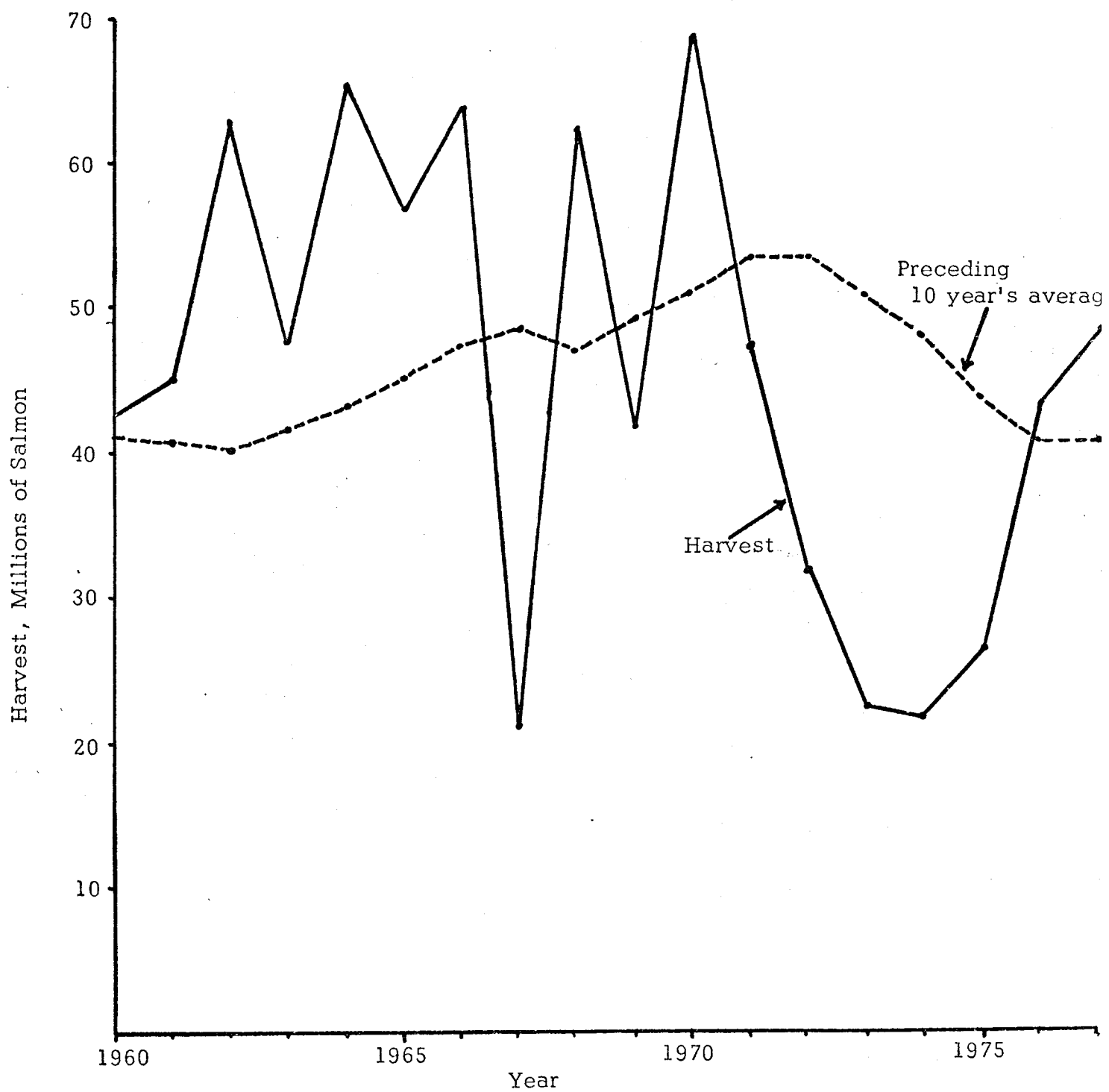
REGIONS:

SOUTHEASTERN ALASKA: Dixon Entrance to Cape Suckling
 CENTRAL ALASKA: Cape Suckling to Scotch Cap on the southwestern tip of Unimak Island
 WESTERN ALASKA: The Aleutian Islands west of Scotch Cap and the Bering Sea north through Kotzebue Sound

AREAS:

- | | | |
|------------------------|--------------------|--------------------------|
| ① Ketchikan | ⑥ Prince Wm. Sound | ⑪ South Peninsula |
| ② Petersburg-Wrangell | ⑦ Resurrection Bay | ⑫ Aleutian Islands |
| ③ Sitka | ⑧ Cook Inlet | ⑬ North Peninsula |
| ④ Juneau-Yakutat | ⑨ Kodiak | ⑭ Bristol Bay |
| ⑤ Copper-Bering Rivers | ⑩ Chignik | ⑮ Arctic-Yukon-Kuskokwim |

Figure 2. 1960-76 Alaskan commercial salmon harvest and preceding 10 year's average.



state. Area biologists, not individually identified, contributed the materials for the discussion of the 1976 fishing season. Individual credit for forecast material is given with the area forecasts presented in Appendix A.

REVIEW OF THE 1976 SEASON

A preliminary estimate of the 1976 Alaskan commercial salmon harvest is 43.4 million fish, the largest since 1971. For the first time since 1970, the harvest exceeded the immediately preceding 10 year's average (see Figure 2).

The harvest was well within the projected range of 26 to 48 million fish issued by the Department in 1975. Catches of pink salmon in southern Southeast Alaska, Chignik and the South Peninsula, and sockeye in Chignik were larger than expected. Pink returns to northern Southeast Alaska, Prince William Sound, Lower Cook Inlet and Bristol Bay, and the chum salmon return to Prince William Sound were not as strong as had been anticipated. Table 2 compares 1976 return forecasts for individual areas and species with preliminary estimates of the actual returns, and Table 3 gives a breakdown of the harvest by species and area.

Southeastern Alaska

The pink salmon harvest in southern Southeastern Alaska approached 5 million fish and the return exceeded 9 million, slightly below the forecast upper limit of 9.6 million. Most fishing was late in the season, as early escapements were not large. The sockeye catch of 235,000 was about equally distributed between the Portland Canal gill net and the Noyes Island seine fisheries. The chum harvest was about average. Net catches of coho salmon were poor.

Pink returns to northern Southeastern were very weak, and the estimated escapement of 740,000 was far below the goal of 4 million. Most sockeye were taken in the upper Lynn Canal and the Taku districts. All sockeye escapements appeared good. The early chum runs were weak, as had been expected. Despite an estimated catch of not much more than 20,000, early run escapements were poor. The fall chum harvest was nearly 500,000, and escapements to major systems appeared good.

Chinook troll catches in Southeastern Alaska were near 200,000 fish, which is below recent levels. Coho troll catches were small early in the season, but in August fishing on the outside coast north of Sitka improved

Table 2. Comparison of actual^{a/} and forecast 1976 salmon returns, with absolute and relative errors, for some major Alaskan salmon fisheries^{b/}.

(Number of fish in thousands)

Area	Species	(1) Harvest ^{a/}	(2) Escapement ^{a/}	(3) Return ^{a/} (1) + (2)	(4) Forecast return	(5) Error: (4) - (3)	(6) Relative Error: (5)/(3) X 100%
Southern Southeastern	Pink	4,800	4,750	9,550	4,100	-5,450	-57%
Northern Southeastern		170	740	910	1,500	590	65%
Southeastern Subtotal		4,970	5,490	10,460	5,600	-4,860	-46%
Prince William Sound	Pink	2,990	870	3,860	6,700	2,840	74%
	Chum	380	80	460	1,800	1,340	290%
Cook Inlet-Southern and Outer Districts	Pink	140	60	200	780	580	290%
Kodiak	Pink	10,660	2,990	13,650	12,900	-750	-5%
Chignik	Sockeye	1,130	820	1,950	720	-1,230	-63%
	Pink	400	510	910	510	-400	-44%
Bristol Bay	Sockeye	6,270 ^{d/}	5,910	12,180	12,000	-180	-1%
	Pink ^{c/}	740	860	1,600	3,050	1,450	91%
South Peninsula	Pink	2,400	1,270	3,670	1,270	-2,400	-65%
Total		30,080	18,860	48,940	45,330	-3,610	-7%

^{a/} Preliminary data

^{b/} Compiled 11/22/76

^{c/} Nushagak District only

^{d/} Includes an estimated 680,000 Japanese high seas catch.

Table 3. Preliminary 1976 Alaska commercial salmon harvest by species and fishing area ^{a/}.

(Number of fish in thousands)

AREA	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	All
Southern Southeastern	56	235	384	4,833	430	5,938
Northern Southeastern	153	200	341	174	499	1,367
Yakutat	1	125	25	24	4	179
SOUTHEASTERN REGION SUBTOTAL	210	560	750	5,031	933	7,484
Prince William Sound	32	1,008	160	2,992	378	4,570
Cook Inlet	11	1,690	219	1,482	518	3,920
Kodiak	1	629	18	10,665	627	11,940
Chignik	1	1,135	33	402	76	1,647
South Peninsula	3	369	0	2,404	572	3,348
CENTRAL REGION SUBTOTAL	48	4,831	430	17,945	2,171	25,425
North Peninsula	7	622	23	0	85	737
Aleutian Islands			NO FISHERY			
Bristol Bay	95	5,593	15	1,033	1,368	8,104
Arctic-Yukon-Kuskokwim	140	15	123	129	1,254	1,661
WESTERN REGION SUBTOTAL	242	6,230	161	1,162	2,707	10,502
TOTAL ALASKA	500	11,621	1,341	24,138	5,811	43,411

^{a/} Compiled 11/22/76

sharply and remained good through mid-September. Inside troll coho catches were below average, but drift gillnet fisheries in the Taku and Lynn Canal did well.

The Yakutat sockeye harvest was better than average, and good escapements were obtained. Other catches were near recent levels.

Prince William Sound

Strong early and middle pink salmon runs to Prince William Sound produced most of the 3 million pink catch. Late runs did not materialize and harvests were limited to a few areas in the Eastern District. The total pink return of about 3.9 million fell below the forecast lower limit of 4.7 million. Pink salmon escapement totaled 870,000 and ranged from poor to very poor in the southern half of the Sound. Escapements were very good in northern and northeast streams. The Sound's chum salmon return of slightly less than half a million was also smaller than the forecast lower limit of 1.1 million. Chum escapement was less than one third of the 300,000 goal.

Good parent-year escapements and egg-to-fry survival, and fine fishing weather throughout the season all contributed to the harvest of 1 million sockeye in the Copper River area. The Bering River run appeared quite early, and the catch was only average. Bering River and Copper River Delta escapements were excellent, but some early-run systems in the upper Copper River could have supported more spawners.

The commercial harvest of chinook salmon in the Copper River area was the highest since 1931. Although the chinook catch has been largely incidental to the sockeye fishery in the past, some gill nets with larger meshes were fished this season. Chinooks brought \$1.50 per pound and fewer were kept for personal use. Escapements appeared to be about normal. The coho season in the Copper and Bering River areas was characterized by extremely bad weather. However, fishing effort was high, probably because of the poor pink and chum returns to Prince William Sound. The harvest, about 160,000, was below average, but the coho return was probably near normal strength.

Cook Inlet

Both pink and sockeye returns to the Upper Cook Inlet area were strong and escapements were generally excellent. Harvests of 1.5 million pinks and 1.7 million sockeye were the highest since the mid-1960's. The

coho catch of 220,000 in this area was slightly below average. Coho returns to the Central District were above average and escapements were good, but catch and escapement in the Northern District were poor. The chum harvest and escapements were also below average.

The pink salmon return of 200,000 to the Southern and Outer Districts of the Lower Cook Inlet area was much less than the nearly 800,000 expected, falling below the forecast range of 210,000 to 1.4 million. Pink escapements were good in the Southern District, but continued to be extremely poor to streams in the Outer District. The pink run in Resurrection Bay was strong and 35,000 were harvested in the first commercial fishery since 1972. The harvest of nearly 60,000 sockeye in the Lower Inlet was better than average, and escapement was good in all systems. There was a strong return of chum salmon to the Kamishak District, and nearly 50,000 were harvested.

Kodiak

The 1976 Kodiak pink salmon harvest of nearly 11 million exceeded expectations and the return of 13.6 million was just below the forecast range high limit of 14 million. Almost half the statewide pink catch came from Kodiak. Escapements were well-distributed. Sockeye and chum harvests were also higher than those of recent years and the sockeye catch exceeded the 1960-75 average by 40%. The total Kodiak salmon harvest was more than 60% above the 1960-75 average.

Chignik

The strong return of pink salmon to the Chignik area of 910,000 exceeded the upper forecast limit by 50,000 fish. Escapement goals were achieved in most streams. The harvest of 400,000 and the 510,000 escapement were the highest in recent years. Similarly, both early and late sockeye runs were strong, yielding a harvest of 1.1 million and a combined escapement of more than 800,000. The sockeye return of about 2 million was nearly twice the forecast range high limit.

Chum and coho harvests were also high. The estimated chum escapement of 200,000 was better than average, and coho escapements to the Chignik River appeared good.

South Peninsula

Pink salmon runs to South Peninsula streams ranged from weak to unexpectedly strong. Pavlov Bay received a record run of nearly 1.8 million,

but returns to other major systems were weak. South Peninsula pinks averaged more than 4 pounds this year, about a pound heavier than usual.

Fisheries in the Shumagin Islands and South Unimak harvested about 300,000 sockeye and more than 400,000 chums. Sockeye escapements to local South Peninsula systems were mostly good. Local chum runs were not strong, and escapements were generally only fair.

Exploratory fishing at Unalaska Island showed very weak pink salmon runs and there was no commercial fishery in the Aleutian Islands.

North Peninsula

Sockeye runs were relatively strong along the North Peninsula northeast of Nelson Lagoon. The harvest exceeded 600,000, and escapement requirements were satisfied in most systems. The chum harvest was above average, but chum escapements were only average or below, except in Nelson Lagoon streams.

Bristol Bay

The Bristol Bay pink salmon harvest was slightly over 1 million fish. Pink returns were weaker than expected but were above the lower forecast limit of 1.5 million fish. Escapements were good in all major systems. Chum salmon catches, the largest since 1916, totaled 1.4 million.

The return of 12.2 million sockeye salmon to the Bay in 1976 exceeded the forecast return of 12.0 million, including an estimated Japanese high-seas harvest of 680,000, by only 1%. For the third consecutive year, escapement goals were achieved in all major river systems. The inshore harvest was 5.6 million.

The chinook harvest was nearly 100,000, reversing a recent decline. Coho catches were well below average, but there was little late-season fishing effort.

Arctic-Yukon-Kuskokwim

Although the 1.7 million salmon harvest for the Arctic-Yukon-Kuskokwim region in 1976 was the third largest ever recorded, catches were higher by about 700,000 in both 1974 and 1975. The decline in 1976 was the result of decreased chum salmon returns. Chum salmon normally comprise nearly 80%

of the catch, and only the Yukon and Kuskokwim district summer chum runs were of average strength. Norton and Kotzebue Sound chum returns were particularly weak, and the catch dropped to about half the 1971-75 average. Considerable improvement in chinook salmon abundance was noted in the Kuskokwim district, but the region-wide catch was near the long-term average.

PRELIMINARY FORECASTS OF 1977 SALMON RETURNS TO SELECTED ALASKAN FISHERIES

The Department's salmon management program includes a number of salmon return forecast projects. Forecast fisheries were selected using several criteria, including economic importance, feasibility, compatability with existing programs and management needs. Forecast fisheries are:

Southern Southeast	-	pink salmon
Northern Southeast	-	pink salmon
Prince William Sound	-	pink and chum salmon
Cook Inlet: Southern and Outer Districts	-	pink salmon
Kodiak	-	pink salmon
Chignik	-	pink and sockeye salmon
South Peninsula	-	pink salmon
Bristol Bay	-	pink and sockeye salmon

In 1976, more than two-thirds of the total statewide salmon harvest was taken in these fisheries.

A variety of information is used to make salmon return forecasts, including escapement magnitudes and distribution, survival to intermediate life stages and population age composition. The return, with upper and lower limits, is predicted for each forecast fishery. Subtracting escapement requirements gives the harvest forecast and range. In general, the actual return can be expected to fall inside the range (between the lower and upper limits) about 75% of the time. In 1976, 6 of the 11 returns forecast were inside their forecast ranges. The 1977 forecasts and ranges are summarized in Table 4.

Table 4. Preliminary forecasts of salmon returns to some major Alaskan fisheries in 1977.

(Number of fish in thousands)

Area	Species	Forecast return	Escapement goal	Estimated harvest	Forecast ^{b/} return range	Estimated harvest range
Southern Southeastern	Pink	12,000	6,000	6,200	9,000 - 15,000	3,300 - 9,100
Northern Southeastern	Pink	<u>2,900</u>	<u>4,000</u>	0	0 - 5,800	0 - 2,100
Southeastern Total	Pink	14,900	10,000	6,200	9,000 - 20,800	3,300 - 11,200
Prince William Sound	Pink	6,300	1,500	4,800	3,100 - 9,500	1,600 - 8,000
	Chum	750	300	450	430 - 1,070	130 - 770
Cook Inlet-Southern and Outer Districts	Pink	850	180	670	310 - 1,380	130 - 1,200
Kodiak	Pink	8,600	1,200	7,400	7,600 - 10,100	6,400 - 8,900
Chignik	Pink	750	580	170	540 - 950	0 - 370
	Sockeye	1,950	650	1,300	1,300 - 2,600	650 - 1,950
South Peninsula	Pink	1,150	1,100	50	550 - 1,700	0 - 600
Bristol Bay, Nushagak District	Pink ^{a/}	0	0	0		
Bristol Bay	Sockeye	<u>8,400</u>	<u>5,500</u>	<u>2,700^{c/}</u>	<u>4,900 - 11,900</u>	<u>0 - 5,900</u>
Total		43,650	21,010	23,740	27,730 - 60,000	12,210 - 38,890

^{a/} Bristol Bay pink runs are negligible in odd years.

^{b/} The forecasted return and harvest ranges are estimated by several techniques. In most cases, about 75% of the realized returns should fall within the range.

^{c/} Inshore harvest only. The forecast total harvest, assuming a 500,000 Japanese offshore catch, is 3.2 million.

Southeastern Alaska

Pink salmon runs in southern Southeast are recovering from effects of the hard winters in 1970-71 and 1971-72. The forecast return of 12 million is expected to allow a harvest of 6.2 million. The outlook in northern Southeast is bleak. The forecast pink salmon return is 3 million and no harvest is anticipated.

Prince William Sound

The Prince William Sound pink return forecast is 6 million, which should allow a harvest of nearly 5 million fish. The chum return forecast is 750,000, and a harvest of about 450,000 is expected.

Cook Inlet - Southern and Outer Districts

Parent-year pink salmon escapements and egg-to-fry survival were excellent in lower Cook Inlet. The forecast return is 850,000 and a harvest of 700,000 is anticipated.

Kodiak

Kodiak area pink salmon runs are expected to total 8.6 million in 1977. At this return level a 7.4 million harvest could be taken. Pink runs in this area were depressed from 1971 through 1975, but the strong return in 1976 appears to have signaled a recovery.

Chignik

Like Kodiak, Chignik pink runs have been poor for several years. The 1977 forecast return of 750,000 would be nearly as large as last year's return. A harvest of 170,000 is expected.

The early and late sockeye runs are expected to be of approximately equal strength, but a larger catch should result from the late run because its escapement goal is lower. The total return forecast is 2 million, and the expected harvest is 1.3 million.

Bristol Bay

The 1977 Bristol Bay sockeye return is forecast at 8.4 million. Accounting for a projected 500,000 Japanese high-seas catch, the anticipated

allowable inshore harvest will be about 2.7 million. Significant harvests are expected only from returns to the Naknek and Egegik Rivers. Pink returns to the Nushagak district are negligible in odd-numbered years.

PROJECTED 1977 ALASKAN COMMERCIAL SALMON HARVESTS

Projections of the 1977 Alaskan commercial salmon harvest by statistical region and species are presented in Table 5. The projections are composed of forecast harvests and recent harvest averages for fisheries without forecasts. Chinook and coho returns are not forecast in any region, and Prince William Sound, in the Central Region, has the only chum forecast. All regions have pink salmon forecasts, but several smaller pink runs are not forecast. Major sockeye runs in the Central and Western Districts are forecast; important exceptions are Copper River, Cook Inlet and Kodiak. Despite these gaps, 72% of the 1976 salmon harvest was taken in forecast fisheries.

The 1977 statewide total commercial harvest projection is 34.7 million salmon.

Species Outlook

Pink Salmon

1977 statewide total harvest projection: 56%, or 19.5 million fish

1976 harvest comparison: 56%, or 24 million fish

Pink salmon catches are expected to decline in two of the three regions. Again in 1977, no significant catch is anticipated in northern Southeastern, but a 30% increase is expected in the southern districts. In the Central Region, increased pink salmon harvests were forecast only in Prince William Sound. Decreases of 35% or more are expected in all other areas. The forecasted South Peninsula 1977 harvest of 50,000 is almost insignificant in comparison with the 1976 catch of 2.4 million. Pink salmon runs are of negligible strength in Bristol Bay in odd-numbered years, which accounts for a projected 1977 catch of less than 100,000 in the Western Region. Pink runs in the Aleutian Islands are still too depressed to allow a commercial fishery.

Table 5. Preliminary projections of 1977 Alaskan commercial salmon harvests by region and species, and projected statewide salmon production by species ^{a/}.

(Number of fish in thousands)

Statistical Region	Species					
	Chinook	Sockeye	Coho	Pink	Chum	All
Southeastern	240	580	760	6,220	950	8,750
Central	40	4,090	380	13,220	2,700	20,430
Western	220	3,020	240	90	1,990	5,560
Total Alaska	500	7,690	1,380	19,530	5,640	34,740
Total production, thousands of pounds ^{b/}	5,400	29,000	7,800	48,000	27,000	117,200

^{a/} Compiled 11/22/76. The projected 1977 harvests were obtained by summing harvest forecasts (Table 4) and harvest projections in the remaining fisheries.

^{b/} Including canned, cured and fresh/frozen salmon and roe.

Sockeye Salmon

1977 statewide total harvest projection: 22%, or 7.7 million fish

1976 harvest comparison: 27%, or 11.6 million fish

Almost no change in the sockeye catch is projected in Southeastern Alaska. A slightly poorer outlook for Prince William Sound and Cook Inlet accounts for the 15% decline expected in the Central Region. Available data on the sockeye runs to Bristol Bay and the North Peninsula point to a markedly reduced harvest in the Western Region in 1977, which explains the bulk of the projected statewide decline.

Chum Salmon

1977 statewide total harvest projection: 16%, or 5.6 million fish

1976 harvest comparison: 14%, or 5.8 million fish

Catches of chum salmon in Bristol Bay are expected to be much smaller than the phenomenally high 1.4 million 1976 harvest. Apart from slight increases in the Central Region, no other major changes are anticipated.

Coho Salmon

1977 statewide total harvest projection: 4%, or 1.4 million fish

1976 harvest comparison: 3%, or 1.3 million fish

Chinook Salmon

1977 statewide total harvest projection: 1%, or 500,000 fish

1976 harvest comparison: 1%, or 500,000 fish

Harvests of coho and chinook salmon are projected at levels near those achieved in 1976.

Regional Outlook

Statewide

1977 statewide total harvest projection: 100%, or 34.7 million fish

1976 harvest comparison: 100%, or 43.4 million fish

The 1977 statewide commercial salmon harvest projection of 34.7 million is 20% down from the 43.4 million 1976 catch. Smaller pink and sockeye returns to the Central and Western regions are responsible for the decline. The harvest of each of these species is expected to drop by about 4 million fish.

Southeastern Region

1977 statewide total harvest projection: 25%, or 8.8 million fish

1976 harvest comparison: 17%, or 7.5 million fish

Catches of pink salmon are expected to increase moderately in southern Southeastern. As in 1976, pink runs to northern districts will probably be too weak to allow fishing. Harvests of other species should remain essentially unchanged.

Central Region

1977 statewide total harvest projection: 59%, or 20.4 million fish

1976 harvest comparison: 59%, or 25.4 million fish

In the Central Region, increased pink salmon catches are forecasted only in Prince William Sound. Moderate to severe declines are projected for other areas in the region. Chum salmon harvests may increase slightly.

Western Region

1977 statewide total harvest projection: 16%, or 5.6 million fish

1976 harvest comparison: 24%, or 10.5 million fish

The projected harvest in the Western Region is about half the 1976 catch. Poor parent-year escapements in the Kvichak River will probably reduce the 1977 catch there to little more than 100,000. The 1976 Kvichak sockeye harvest exceeded 1 million. The projected chum harvest in Bristol Bay is 40% of the very-high 1976 catch. Bristol Bay pink runs are negligible in odd-numbered years.

DISCUSSION

While year-to-year variability in Alaska's salmon harvest has always been prominent, catches were generally lower during the 1950's than during the

1960's. But after the 68 million harvest in 1970, salmon fisheries became increasingly depressed, and until 1975 each year was poorer than the last. As Figure 3 shows, this smooth decline is not all typical. In fact, from 1950 to 1970, there were never more than three consecutive declines. The usual irregularity in yearly salmon harvests is also reflected in the separation of only 2 years between the smallest and largest catches during the 26-year period from 1950 to 1976 -- 21 million in 1967 and 68 million in 1970.

The 1970-71 and 1971-72 winters and springs were severe, and available information on egg, fry and juvenile salmon mortality during this period suggests that poor freshwater and early marine survival, not inadequate escapement, was the chief cause of weak salmon returns from 1972 through 1975. Pink salmon runs were most seriously affected, but 1976 pink returns were above average strength for most areas in the Central and Western regions. Pink runs in northern Southeastern Alaska inexplicably have continued to decline, while southern Southeastern runs appear to have recovered, at least to levels of the 1960's.

Fifteen-year average commercial salmon harvests for the period 1962-76 are shown in Table 6, and Figure 4 displays relative differences in the 1976 harvests from the averages.

All species in Southeastern Alaska were at least 30% below the 15-year average in 1976, and the total Southeastern catch was 50% down. The Central Region harvest exceeded the average by more than 20%, with increases of 30% or more in sockeye and pink salmon catches. Salmon harvests in the Western Region were up 6%, with a strong pink return. Chum salmon runs were exceptionally large in Bristol Bay, but down from recent levels in Arctic, Yukon and Kuskokwim areas, where salmon fisheries began developing in the 1960's. Statewide, the total harvest was about 5% below the 15-year average. Coho catches in the Western Region were up slightly, but decreases of 30% in Southeastern Alaska and 15% in the Central Region forced the statewide coho harvest nearly 25% below the average. Other statewide differences were less than 15%.

In general, Alaskan salmon harvests reached historic peaks in the 1930's, began a steep decline in the early 1940's and remained at low levels through the 1950's. There was considerable improvement during the 1960's. To illustrate more recent harvest trends, Figure 5 presents the percentage changes of the present 1962-76 harvest averages from the 15-year averages current ten years ago in 1966, covering the period 1952-66. The 1952-66 averages are given in Table 7. Overall differences are small, because lower harvests during the 1950's are balanced by those in the 1970's, and both averages include higher 1960 catches. But some regional and species harvest changes are highlighted.

Figure 3. Alaskan salmon harvest by species, 1950-1976.

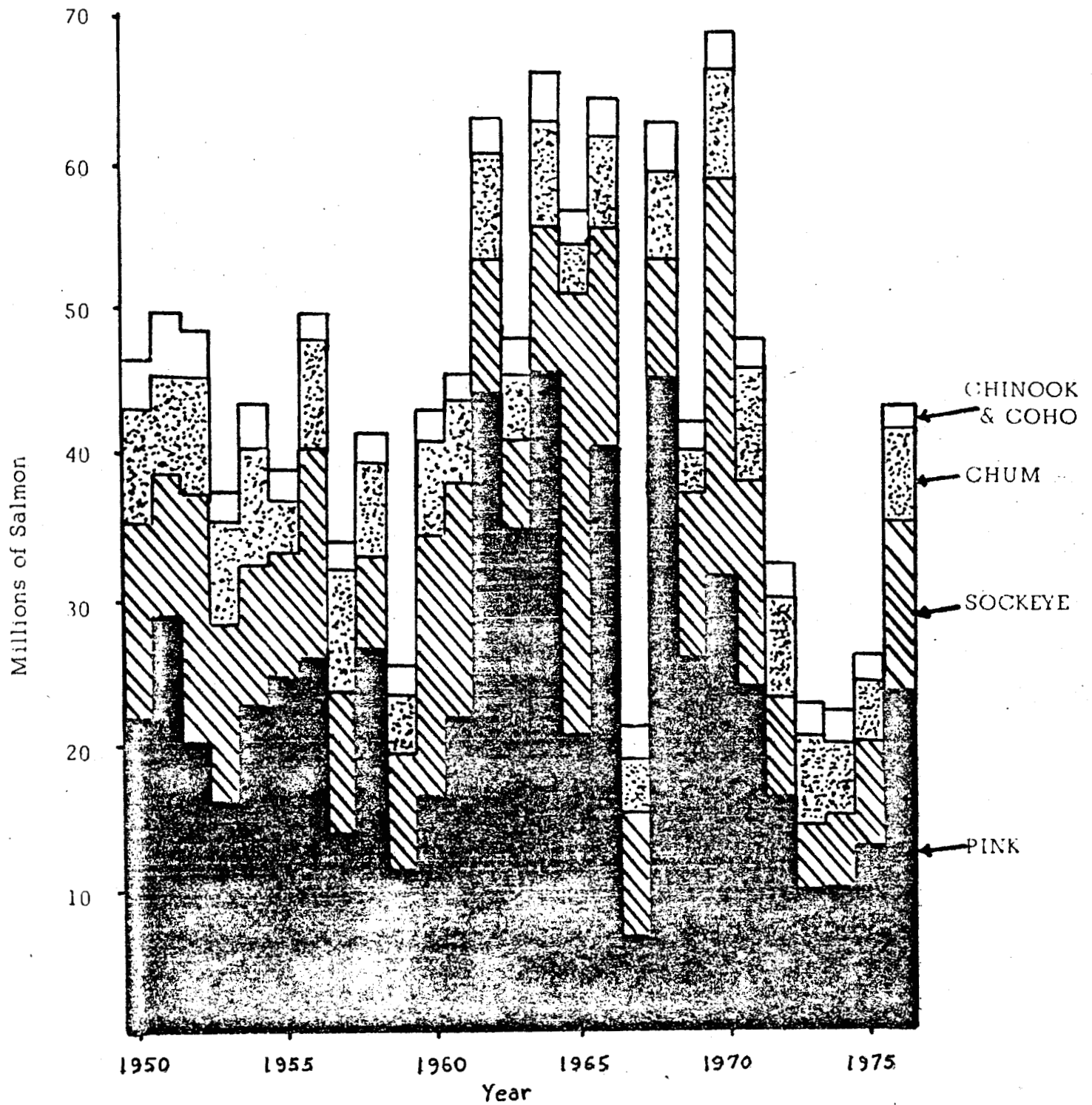


Table 6. 1962-1976 average commercial Alaskan salmon harvest, by region and species ^{a/}.

(Thousands of fish)

Statistical Region	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	All
Southeastern	301	790	1,089	11,100	1,843	15,123
Central	33	3,593	508	13,801	2,505	20,440
Western	234	7,326	162	979	1,290	9,991
Total Alaska	568	11,709	1,759	25,880	5,638	45,554

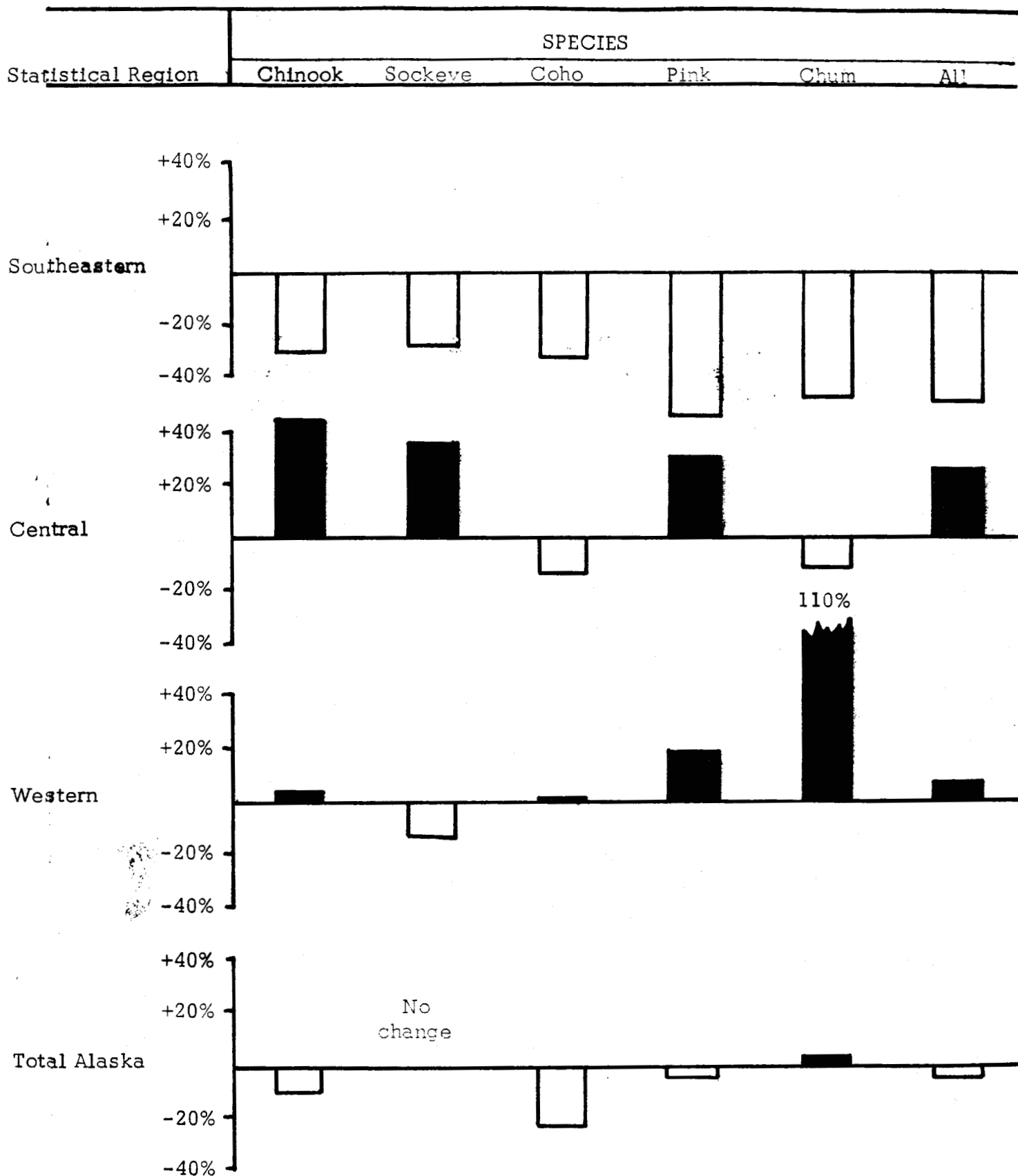
^{a/} 1976 harvest data is preliminary. Compiled 11/22/76.

Table 7. 1952-66 average commercial Alaskan salmon harvest, by region and species.

(Thousands of fish)

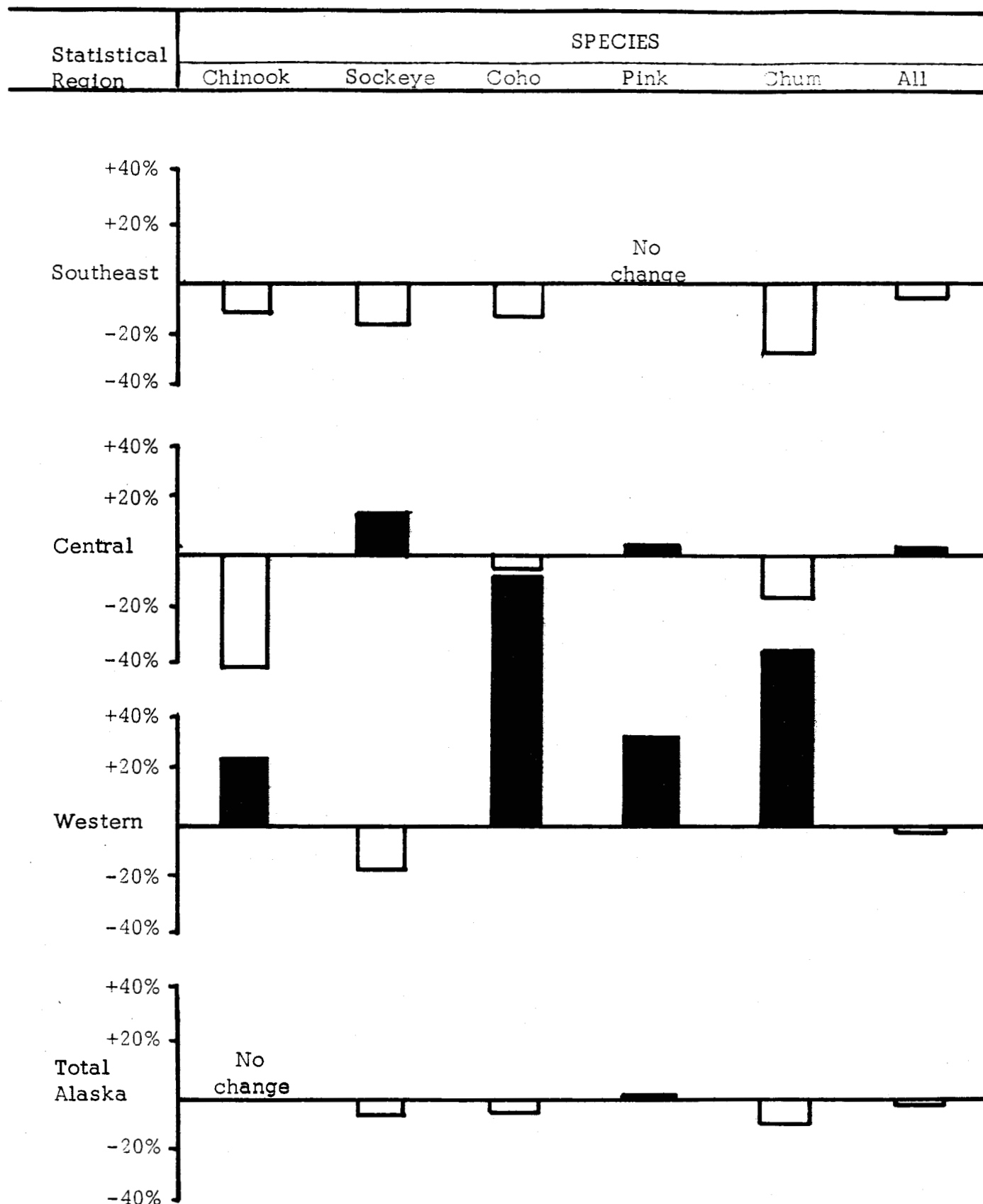
Statistical Region	SPECIES					
	Chinook	Sockeye	Coho	Pink	Chum	All
Southeastern	331	915	1,246	11,154	2,490	16,136
Central	56	3,118	524	13,388	3,016	20,102
Western	181	8,601	84	747	792	10,405
Total Alaska	568	12,634	1,854	25,289	6,298	46,643

Figure 4. Percentage increase or decrease of the 1976 commercial Alaskan salmon harvest^{a/} from the 1962-76 average, by region and species.



^{a/} Preliminary data. Compiled 11/22/76

Figure 5. Percentage increase or decrease in the 1962-76 average commercial Alaskan salmon harvest from the 1952-66 average by region and species ^{a/}.



^{a/} 1976 data is preliminary.
Compiled 11/22/76.

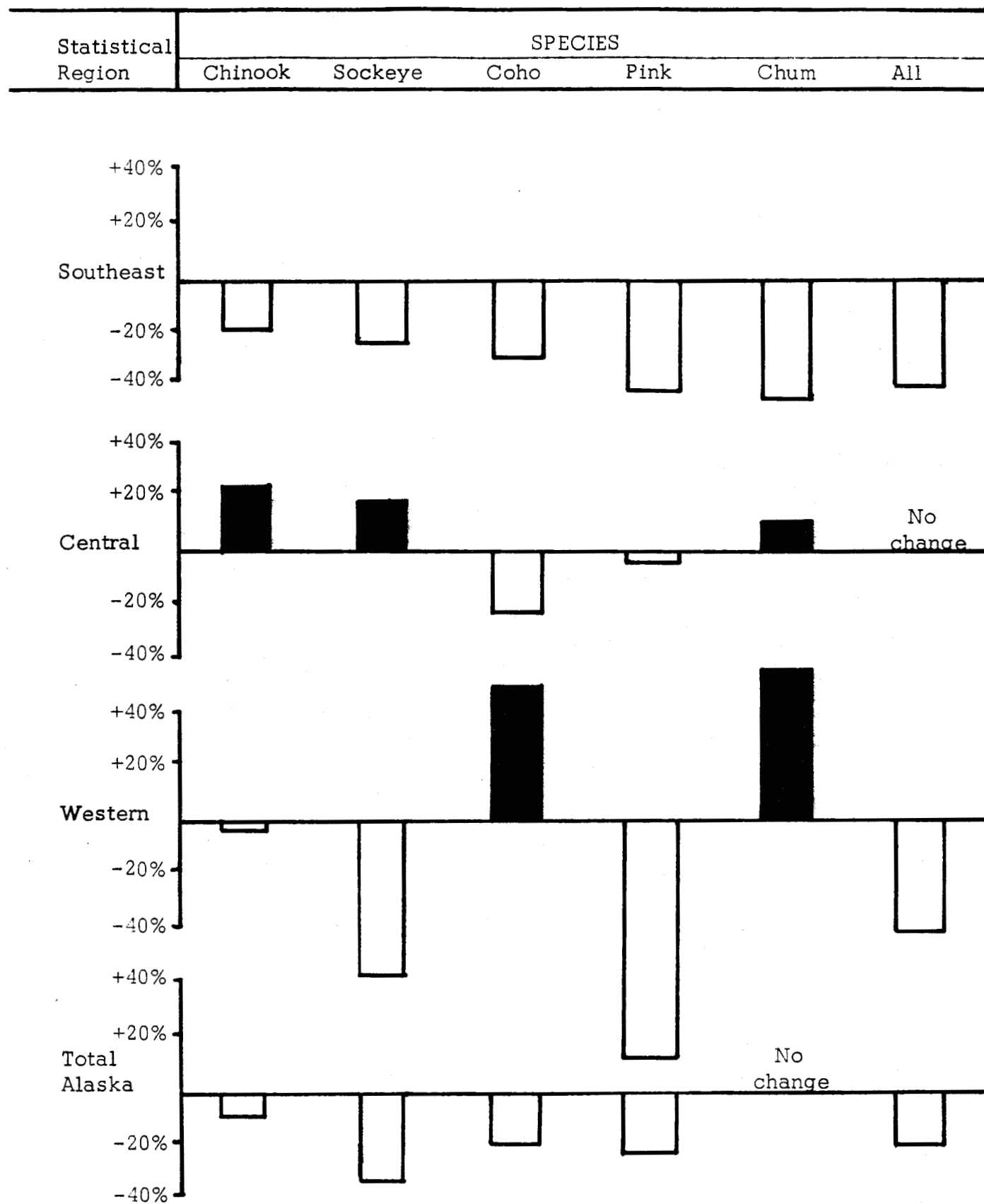
Average catches of every species but pink salmon have declined by more than 10% over the past ten years in Southeastern Alaska. Despite reduced harvests since 1971, and the continued severe depression of northern Southeastern stocks, average catches of pink salmon have decreased by less than 1% since 1966. The Southeastern chum salmon catch, on the other hand, is down more than 25%. Central Region sockeye and pink harvests have improved; sockeye catches are up 15%. But the chum salmon harvest has decreased by more than 15%, and chinook and coho catches have also dropped. Overall, however, the Central Region salmon harvest has improved slightly since 1966. Because of developing Arctic, Yukon and Kuskokwim fisheries, Western Region harvests of all species except sockeye have increased significantly. Bristol Bay and North-Peninsula sockeye harvests have been restrained in recent years to insure good escapements, which have been excellent for the past three years. Statewide, sockeye, coho and chum salmon 15-year averages are down. Coho and chum harvests both show large relative increases in the Western Region, which were not offset by declines in the other regions. Alaska's chum salmon catch has dropped by 10% since 1966.

Figure 6 shows relative differences in the preliminary 1977 harvest projections from the current 1962-76 averages.

Projected decreases in Southeastern Alaska salmon harvests all exceed 20%, both chum and pink salmon catches are expected to drop more than 40% below the recent average. Apart from the projected 25% decrease in coho catches, harvests in the Central Region should either be improved or similar to the average. Expected weak sockeye returns and the negligible odd-year pink run in Bristol Bay will probably reduce the 1977 Western Region catch to less than 60% of the 1962-76 average. Statewide, harvests of all species except chum salmon are projected to be at least 10% below average. The most important commercial species, sockeye and pink salmon, are expected to be down by more than 25%.

Several points need to be kept in mind when interpreting these historical and projected catch statistics and comparisons. First, smaller harvests do not necessarily imply a continuing deterioration of the resource. Recent poor harvests have to a large measure been due to restrictions in fishing time imposed to obtain needed escapements from below average returning runs. Through extensive study and analysis, the Department has established escapement goals for most of the important salmon fisheries of the State. Close monitoring and management of, for example, sockeye and pink fisheries in Bristol Bay and the Alaska Peninsula, sockeye in the Cook Inlet area and pink salmon runs in southern Southeastern Alaska has produced escapements close to targeted values in recent years. Assuming average survival, Alaska's future commercial salmon harvests should soon reflect these careful and reasoned escapement investments.

Figure 6. Percentage increase or decrease of the 1977 commercial Alaskan salmon harvest projection^{a/} from the 1962-76 average, by region and species.



^{a/} Based on preliminary 1976 data. Compiled 11/22/76.

APPENDIX A. FORECAST METHODS AND DISCUSSIONS

FORECAST AREA: Southeastern Alaska

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1977 RETURN:

Southern Southeastern

Point Estimate: 12.0 million

Range Estimate: 9.0 million - 15 million

Northern Southeastern

Point Estimate: 2.9 million

Range Estimate: < 1 million - 5.8 million

Total Southeastern

Point Estimate: 14.9 million

Range Estimate: 9.0 million - 20.8 million

FORECAST METHODS

Returns referred to in this forecast are more precisely return indices, as they are the sum of the commercial catch and the escapement index rather than the sum of catch and total escapement estimates.

Southeastern pink salmon forecasts are based primarily on the relationship between pre-emergent fry density indices and subsequent adult returns. Additionally, data on escapements, estuarine temperature, air temperature, precipitation, and other factors are examined to improve the forecast analysis. Separate forecasts for southern and northern Southeastern have been calculated since 1967 because of differences in migration routes and abundance trends of pink salmon stocks from the two areas.

For the 1977 southern forecast a multiple linear regression for adult return using the pre-emergent fry index and Ketchikan surface sea water temperature was used. The 1977 northern return forecast is based on a

multiple regression using weighted pre-emergent fry values and air temperatures. The raw district fry indices are weighted to compensate for the variation in the proportion of the escapement which occurs in sample streams and also to account for differences in the available spawning area between districts. The forecast range is an 80% confidence interval about the predicted return except that the lower limit of the southern unit forecast was set at the low level of return obtained in 1973, 1974 and 1975. We do not expect the return to be any smaller.

DISCUSSION OF THE 1977 FORECAST

Pink salmon runs to most southern districts are showing some signs of improvement. Escapement indices in the parent year (1975) were higher than in the previous 3 years and larger fry indices were obtained in many streams in the spring of 1976. Climatic factors during the periods of incubation, emergence and early marine growth appear to have been favorable. However, poor returns are expected to early-run streams of the northern Behm and Bradfield Canals, San Alberto Bay and the northern portions of Districts 5 and 6. Careful management of intercepting fisheries will be required to insure that escapement goals are met in all areas. Timing of the return in the southern districts is expected to be similar to that of the past several years, with the greatest strength in the middle and late runs.

Pink salmon returns to the northern districts unfortunately have not shown signs of recovery but rather have continued to decline. Escapements in nearly all areas in the parent year were far below escapement goals and the fry index in 1976 was the second lowest we have found since the sampling began. No harvestable surplus of pink salmon is expected, except possibly in isolated bays in the late run areas of Sitka Sound, Slocum Arm or the west coast of Kuiu Island.

Prepared by: Alan Kingsbury
Fisheries Research Biologist
Juneau

Paul Larson
Fisheries Research Biologist
Ketchikan

FORECAST AREA: Prince William Sound

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1977 RETURN:

Point Estimate: 6.3 million

Range Estimate: 3.1 million - 9.5 million

FORECAST METHODS

Prince William Sound pink salmon forecasts are based on pre-emergent fry indices obtained from a standard list of streams and sample zones. Linear regression analysis is used with the pre-emergent fry data from the brood year to establish the point and range estimates for the adult return.

DISCUSSION OF THE 1977 PRELIMINARY FORECAST

The 1977 adult pink salmon return is the result of the 1975 estimated pink escapement of 1,618,000. The pre-emergent fry index resulting from that escapement was 264 fry per square meter. Calculated return for this fry density is 6.3 million fish. Variability between past forecasts and actual returns indicates that the actual return should be within 3.2 million fish of this value.

The commercial harvest point estimate is 4.8 million fish with a range of 1.6 to 8.0 million. The harvest point estimate and range are based on estimated escapement requirements of 1.5 million fish.

Fry index magnitudes suggest that returning pink stocks will be primarily destined for the Eastern, Coghill, and Southeastern Districts. Fair catches might result from some stocks headed for the northern portion of Montague Island.

If the run timing experienced since 1973 holds true for 1977, the early and middle portions of the run should provide the bulk of the expected return bound for the Eastern District. Coghill should have a large early run and the stocks headed for the Southeastern District are expected to bolster the middle portion of the return.

SPECIES: Chum Salmon

PRELIMINARY FORECAST OF 1977 RETURN:

Point Estimate: 750,000

Range Estimate: 430,000 - 1.1 million

FORECAST METHODS

Statistical methods used to forecast chum salmon return are similar to those used for pink salmon. However, a different set of index streams is used, and the forecast is based primarily on past returns of 4-year-old fish which have averaged about 75% of the total annual returns. Chums returning to Prince William Sound also mature at 3, 5, and 6 years of age.

DISCUSSION OF THE 1977 PRELIMINARY FORECAST

Escapement for the 1973 brood year was 546,000 fish. This escapement provided a pre-emergent fry index of 117 fry per square meter. This index is the second largest in the forecast program's history. Estimated return is 750,000 fish.

That this index did not indicate a higher return of chum salmon is due to the negative influence of the 1976 index of 141 which resulted in a return of only 460,000 fish.

However, other evidence suggests that 1973 brood stock will return in good abundance. The spring and summer of 1974 were quite warm, and a large proportion of the 1976 return consisted of 3-year-old fish (24%). These factors, coupled with very favorable estuarine conditions, indicate that marine survival for the 1973 brood stock was high.

The commercial harvest point estimate is 450,000 fish with a range of 130,000 to 770,000. The point and range estimates are based on estimated escapement requirements of 300,000 fish.

Prepared by: Michael L. McCurdy
Fisheries Research Biologist
Cordova

FORECAST AREA: Cook Inlet - Southern and Outer Districts

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1977 RETURN:

Point Estimate: 850,000

Range Estimate: 300,000 - 1.4 million

FORECAST METHODS

The 1977 pink salmon forecast for the Southern and Outer Districts of Cook Inlet is derived from the relationship between pre-emergent fry densities and subsequent returns. Indices of pre-emergent fry abundance in nine major spawning streams are obtained in the spring prior to fry emergence. The fry densities of each stream are weighted by the average escapement for that stream. The resultant individual stream indices are then summed to obtain a single weighted pre-emergent fry index. This index is used with standard linear regression methods to calculate the forecast.

DISCUSSION OF THE 1977 FORECAST

The 1975 pink salmon escapement of 240,000 was considerably above the average for the nine index streams of 160,000 and produced the second-highest pre-emergent fry index since the inception of the forecasting program. A normal spring breakup coupled with a mild summer should have enhanced pink salmon growth and survival, and an excellent return is expected in 1977. Historically, about four pink salmon adults return for each spawner; this suggests a 1977 return of approximately 1 million. This is higher than the forecasted point estimate of 850,000 and it is expected that the total return will be in the upper end of the range. Good catches are expected throughout both districts, with the exception of Rocky Bay in the Outer District.

Prepared by: Thomas R. Schroeder
Area Biologist
Homer

FORECAST AREA: Kodiak

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1977 RETURN:

Point Estimate: 8.6 million

Range Estimate: 7.6 million - 10.1 million

FORECAST METHODS

The 1977 pink salmon forecast return to the Kodiak management area was calculated using the linear relationship between pre-emergent fry densities and subsequent adult returns. Densities obtained from 23 Kodiak-Afognak Island streams were combined to form an overall pre-emergent fry index. A linear regression with all years data was used for the point estimate, a ratio calculation of odd-numbered cycle year density/return averages for the lower limit and a linear regression with all years data excluding years 1971 through 1973 for the upper limit. As in the past, qualitative indicators influenced the range spread; a narrower but more useful range was selected over the wider confidence interval associated with the point estimate. The mainland district forecast was developed from ratio calculations relating parent-year density/return data with the combined density from six streams. All district catch projections assume minimum escapement goals are met. Analysis of estuarine temperature data, yet unfinished, may entail minor adjustments to this preliminary forecast.

DISCUSSION OF 1977 FORECAST

Pre-emergent fry sampling indicated good to excellent winter survival from a well-distributed brood-year escapement which was 5% below the average odd-numbered year escapement. Sampling yielded an unweighted index of 158 fry per square meter, a 25% increase above the average odd-year index of 118 and one which is second in magnitude only to the 198 index which provided the excellent 1969 return of 13.8 million pinks. Brood-year escapement to the index streams was 79% of the total as compared to the odd-year average of 68%.

For 1977, 7.6 to 10.1 million pink salmon are expected to return to the Kodiak management area. With a minimum escapement of 1.2 million required, a harvest of 6.4 to 8.9 million is expected.

A breakdown of the expected return by major geographical districts is outlined below. Also a comparison is made between fry densities

obtained for the excellent 1969 return and those obtained for the 1977 return.

Afognak District: District pre-emergent fry density was 24% above the odd-numbered year average. Survival was very good from a fair brood year escapement. Index streams received 50% of the district escapement; major natural contributors to this district's return will be the Perenosa Bay and Kitoi Bay systems. In addition there will be some supplemental production from the Kitoi Bay Hatchery and from eyed egg transplants in Izhut Bay streams. Considering Afognak's even-year dominance, only about 5% of the 1977 island return will occur in this district. With minimum escapement requirements of 70,000, a harvest of from 280,000 to 390,000 pinks is expected.

Westside District: District pre-emergent density was 39% above the odd-year average and 24% above the 1969 return's district density. Survival was very good from an excellent brood year escapement. Index streams received 84% of the district escapement; major odd-year production systems remain Uyak, Uganik, Terror, and Zachar Rivers in that order. Approximately 31% of the island return should occur in this district. With minimum escapement requirements of 200,000, a harvest of 1.9 to 2.6 million is expected.

Alitak District: District pre-emergent fry density was 33% above the odd-year average and 29% below the 1969 return's district density. Survival was good from a very good brood year escapement. Index streams received 83% of the district escapement. Humpy and Deadman remain the major production systems, but the inner Olga Bay system will be significant contributors to this district's production which should provide approximately 27% of the island return. With minimum escapement of 330,000, a harvest of 1.5 to 2.2 million is expected.

General District: District pre-emergent fry density was 5% below the odd-year average, and 23% below the 1969 return's district density. Survival was fair to good from a good brood year escapement. Index streams received 75% of the district escapement. The major production systems are Seven Rivers, Barling and Saltry Rivers. The Inner Marmot and Chiniak Bay areas should be the weakest portion of this district's production which should provide approximately 37% of the island return. With minimum escapement requirements of 400,000, a harvest of 2.2 to 3.0 million is expected.

Mainland District: District pre-emergent fry density was very strong. Survival was very good from a healthy brood year escapement, particularly in the Kukak section. Index streams received 65% of the district

escapement. Major odd-year production systems will be Village, Kinak, and Dakavak Creeks. Approximately 70% of the district return should occur in the Kukak section, with only 10% of the total Kodiak area return occurring in this district. With a minimum escapement level of 200,000, a harvest of 500,000 to 700,000 is expected.

Prepared by: Larry Malloy
Assistant Area Finfish Biologist
Kodiak

FORECAST AREA: Chignik

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1977 RETURN:

Point Estimate: 750,000

Range Estimate: 540,000 - 950,000

FORECAST METHODS

Since pre-emergent sampling design within this project has fluctuated standard regression analysis cannot be used. This forecast is primarily based on historical escapement and return data, climatic factors, and pre-emergent fry densities.

DISCUSSION OF THE 1977 FORECAST

The Eastern District has thirteen major systems. Only the Cape Kumlium and Thompson Valley systems are odd-numbered year contributors. These systems accounted for about 60% of the 1975 Eastern District escapement.

Because of stream ice conditions during the 1976 pre-emergent sampling season, only Main Creek was sampled. The pre-emergent fry density was the highest ever observed in this stream.

The mean odd-year return per spawner ratio excluding 1971 is 1.2. The range is .7 to 1.6. Using the above ratios with escapement gives a forecast range of 30,000 - 70,000 pinks. All indications point toward the upper end of the range.

Pre-emergent fry densities are highly correlated with subsequent returns in the Western District. Ivan River contributed about 70% to the total 1975 escapement. Pre-emergent fry density was higher than any measured in the past 6 years. Conversely, the second major contributor (Red Bluff Creek) yielded a low pre-emergent fry density, but early outmigration is suspected.

The low limit of 400,000 and the upper limit of 675,000 were approximated by using the lowest mean return per spawner (3.0) for the Western District (only odd cycle years were used, excluding 1971 and 1973 data) and the highest odd-year mean of 4.5 (also excluding 1971 and 1973 data).

The combination of good pre-emergent fry densities and weather conditions suggests that the return should exceed the mid point of the range.

In the Perryville District, the systems accounting for most of the total 1975 escapement are the Ivanof River (74%) and Humpback (20%). The Ivanof pre-emergent fry density was lower than its odd-year mean but the Humpback density was considerably higher.

Using the lowest return per spawner (odd years, excluding 1971 and 1973) of 1.8 and the highest (all years) of 2.6, gives a range of 80,000 to 120,000.

This year's low pre-emergent density in the Ivanof River indicates that the 1977 return will probably fall in the lower portion of the range.

The 1977 pink salmon catch will be primarily restricted to the Western District and the Chignik Bay incidental catch. The Western District catch could be as high as 300,000 pinks.

Prepared by: Larry Nicholson
Assistant Area Management
Biologist
Chignik Area

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF 1977 RETURN:

Point Estimate: 2 million

Range Estimate: 1.3 million - 2.6 million

FORECAST METHODS

A number of methods were used. The majority of Chignik sockeye spend 3 winters in the ocean, and the number of fish returning after 2 years is related to the following year's return. Escapement-return (return per spawner) relationships are also used. The Fisheries Research Institute, University of Washington, provides fry density data from Black Lake which is used to predict the strength of the early run. Pre-emergent fry sampling is done to determine the extent of winter mortality on eggs and fry.

DISCUSSION OF THE 1977 FORECAST

The early run to Black Lake in June and the later run in July and August are expected to be of approximately the same magnitude. A larger harvest is anticipated from the late run because the escapement goal is lower. Escapement goals for the two runs are 400,000 and 250,000, respectively.

Prepared by: Arnold R. Shaul
Chignik Area Biologist
Kodiak

FORECAST AREA: South Peninsula

SPECIES: Pink Salmon

PRELIMINARY FORECAST OF 1977 RETURN:

Point Estimate: 1.1 million

Range Estimate: 550,000 - 1.7 million

DISCUSSION OF THE 1977 FORECAST

Pre-emergent fry indices were higher in some streams, but since the systems contributing major portions of the run were not sampled as a result of ice conditions, no conclusions could be made regarding pre-emergent fry survival.

As estuarine water temperatures were not available, spring ambient air temperatures were used with linear regression to predict return per spawner. The correlation coefficient was .86 and the predicted 1977 return per 1975 spawner was 1.06. Applying this to the 1975 escapement of 525,000 yields a return of 550,000 pinks. This figure was used for the lower limit of the range.

The upper limit of this forecast was established by using the odd-year return-per-spawner mean for 1961-73 of 3.22 returning adults per spawner. The resulting upper limit is 1.7 million.

It seems likely that the actual return will be below 1 million fish.

Prepared by: Larry Nicholson
Assistant Area Management
Biologist
Chignik Area

FORECAST AREA: Bristol Bay

SPECIES: Sockeye Salmon

PRELIMINARY FORECAST OF 1977 RETURN:

Point Estimate: 8.4 million

Range Estimate: 4.9 million - 11.9 million

FORECAST METHODS

Most Bristol Bay sockeye salmon mature 4 to 6 years from the time of spawning. The run in 1977 will, therefore, be the progeny of the escapements of 1971, 1972 and 1973. The total Bristol Bay forecast is the sum of the forecasts of individual river systems, each based on one or more of the following methods:

- (1) Escapement-return relationships, based on historical data, provide estimates of total production from each brood year escapement. Average marine maturity schedules are then applied to estimate the numbers of adult salmon returning each year.
- (2) On the Kvichak, Naknek and Ugashik Rivers, numbers of smolt migrating to the ocean are enumerated annually. The return of adult salmon each year is estimated using these smolt counts, past survival data and average maturity schedules.
- (3) For each river system, relationships between the number of adult fish returning in a particular year and the number of adult fish from the same parent escapement and freshwater age group that will return the following year have been derived.

To aid in the selection of forecast techniques, a measure of residual variance, the standard error of forecast, is calculated for each method, age class and system.

DISCUSSION OF THE 1977 FORECAST

The 1977 return forecast is 8.4 million sockeye salmon, composed of approximately equal numbers of fish which will have spent 2 and 3 years in the ocean. Escapement requirements for Bristol Bay in 1977 total 5.5 million fish.

The point estimate of total harvestable surplus, 3.2 million fish, does not take into account the Japanese high seas fishery. If exploitation continues at past levels without restriction, the Japanese could be expected to harvest approximately 500,000 Bristol Bay sockeye, reducing the inshore harvest to 2.7 million.

At this level of high seas harvest, a significant inshore harvest for only two systems--Naknek (1.2 million); and Egegik (900,000) can be expected. A low return to the Kvichak River (2.1 million fish) is anticipated as a result of the poor escapements experienced in 1972 (1.0 million) and 1973 (200,000). Escapement requirements for the Kvichak River in 1977 are 2.0 million, allowing an inshore harvest of only 140,000 sockeye salmon. Estimates of inshore harvest by district in descending order of magnitude are: Naknek-Kvichak - 1.3 million; Egegik - 900,000; Nushagak - 400,000 and Togiak - 100,000. The inshore return to the Ugashik River is expected to fall below spawning requirements.

SPECIES: Pink Salmon

Pink salmon returns to the Nushagak District in Bristol Bay are negligible in odd-numbered years.

Prepared by: Kenneth Parker and
Paul Krasnowski
Bristol Bay Research
Anchorage

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